CHEM-111: INTRODUCTION TO ORGANIC & BIOLOGICAL CHEMISTRY

Effective Term
Fall 2026

CC Approval
09/05/2025

AS Approval
10/09/2025

BOT Approval
10/16/2025

COCI Approval
12/12/2025

SECTION A - Course Data Elements

CB04 Credit Status
Credit - Degree Applicable

Discipline

Chemistry (Master's Degree)

Subject Code
CHEM - Chemistry
Course Number
111

Department
Chemistry

Division
Science and Engineering (SE)

Full Course Title
Introduction to Organic & Biological Chemistry

Short Title
Intro to Organic & Bio Chem

CB03 TOP Code
1905.00 - Chemistry, General

CIP Code
40.0501

CB08 Basic Skills Status
NBS - Not Basic Skills

CB09 SAM Code
E - Non-Occupational

Rationale
Updating textbook and Laboratory Manual,
Including learning activities under online adaptations.

SECTION B - Course Description

Catalog Course Description
An introduction to the important principles, compounds and reactions of organic and biological chemistry with an emphasis on biochemical behavior of the molecules. Laboratory includes an introduction to the basic techniques of organic and biological chemistry. For students pursuing nursing and allied health careers who need a year of chemistry that includes an introduction to organic and biological chemistry, Intro or Gen Chem 1 and this course will fulfill that requirement.

SECTION C - Conditions on Enrollment

Open Entry/Open Exit
No

Repeatability
Not Repeatable

Grading Options
Letter Grade or Pass/No Pass

Allow Audit
Yes

Requisites

Prerequisite(s)
Completion of CHEM-110 with a minimum grade of C.

Requisite Justification

Requisite Description
Course in a Sequence

Subject
CHEM

Course #
110

Level of Scrutiny
Content Review

Upon entering this course, students should be able to:
1. Understand the flow and stability of electrons as it relates to Lewis Structures (Structural Formulas).
2. Using ratios, solve ideal gas law expressions, problems using concentration and dilution, gram/mole/atom conversions, and stoichiometric expressions.
3. Relate atomic structure and electron configuration to bonding and properties of solutions.

SECTION D - Course Standards

Is this course variable unit?
No

Units
4.00

Lecture Hours
54.00

Lab Hours
54.00

Outside of Class Hours
108

Total Contact Hours
108

Total Student Hours
216

Distance Education Approval

Is this course offered through Distance Education?
Yes

Online Delivery Methods

Entirely Online	Emergency Only
Hybrid	Permanent
Online with Proctored Exams	Emergency Only

SECTION E - Course Content

Student Learning Outcomes

	Upon satisfactory completion of the course, students will be able to:
1.	Describe chemical and physical processes at the molecular level and how they relate to organic and biological systems.
2.	Solve both qualitative and quantitative chemistry problems while demonstrating the reasoning clearly and completely.
3.	Implement laboratory techniques correctly using appropriate safety procedures and express them clearly in written laboratory reports.

Course Objectives

	Upon satisfactory completion of the course, students will be able to:
1.	Explain how the principles of chemical measurement apply to biological systems, including the isolation, identification and characterization of biomolecules.
2.	Relate the functioning of chemicals to their structure and apply these concepts to enzyme assays.
3.	Explain how chemical-bonding theory is used to correlate the function of chemicals in biological systems.
4.	Explain the role of energy expenditure in biological systems to maintain the structural integrity of the system.
5.	Show how water stabilizes the reaction rates and structures found in biological systems that have been stressed by changes in temperature, pH, and osmolality.
6.	Relate how the chemical components of a cell interact to provide energy flow and structural integrity to the system. Include the role of DNA, RNA and proteins in this process and describe how inhibitory processes interact with life systems.
7.	Explain how molecular structure relates to the flow of information in a cell and how these processes are used in biotechnology.

Course Content
Lecture Content

1. Overview of chemistry in relation to physics and biology
2. Historical perspective of organic and biochemistry
3. Development of chemical principles in relation to organic and biological chemistry
4. Bond energies
5. Spontaneity and equilibrium as applied in biochemistry
6. Rates of chemical reactions
7. Simple Compounds of Carbon
    a. Nomenclature and structure
    b. Single, double and triple bonds
    c. Resonance: Structure and function

8. The Variety of Organic Compounds
    a. Functional groups
    b. Properties: Physical and chemical and structure
    c. Identification and analysis
    d. Synthesis
9. Molecules and Life
    a. Flow of biological information
    b. The water matrix
    c. Biomolecules in water
    d. Amino acids, peptides and proteins
10. Dynamic Function of Molecules
    a. Protein structure and function
    b. Enzymes: Reactions, kinetics, inhibition and applications
    c. Enzymes: Coenzymes, regulation, catalytic antibodies and ribozymes
    d. Carbohydrates: Structure and function
    e. Lipids: Biological membranes and cellular transport
11. Storage and Transfer of Biological Information
    a. DNA and RNA: Structure and function
    b. Metabolism of carbohydrates
    c. Production of NADH and NADPH citric-acid cycle
    d. ATP formation by electron - transport chains
    e. Metabolism of fatty acids and lipids
    f. Metabolism of amino acids and nitrogenous compounds

Lab Content

1. Molecular models and isomers
2. Identification of functional groups
3. Properties of sugars
4. Preparation of esters
5. Synthesis of aspirin
6. Preparation of soap
7. Preparation of hand cream
8. Properties of amines and amides
9. Analysis of amino acids

Methods of Instruction

Methods of Instruction

Types	Examples of learning activities
Lab	Chemical demonstrations. Video presentations. Individual and group problem solving in the classroom. Peer oriented guided instruction where the students help one another under the guidance of an instructor.
Lecture	Chemical demonstrations. Individual and group laboratory experiments. Peer oriented guided instruction where the students help one another under the guidance of an instructor.

Online Adaptation

Types	Examples of learning activities
Lecture	There will be no online adaptation for lab but for lecture, Zoom recordings will be made available for each class.
Journal	Students will receive credit for weekly journal entries as well as instructor feedback.

Instructor-Initiated Online Contact Types

Announcements/Bulletin Boards
Chat Rooms
Discussion Boards
E-mail Communication
Video or Teleconferencing

Student-Initiated Online Contact Types

Chat Rooms
Discussions
Group Work

Course design is accessible

Yes

Methods of Evaluation

Methods of Evaluation

Types	Examples of classroom assessments
Exams/Tests	Three midterm exams will be given along with a final exam. All exams will be fill in, multiple choice, true/false, and short answer, and will be graded on a point scale (100 pts for a midterm, 200 pts for the final). A sample question may be, what is the empirical formula of a compound that is 75% carbon and 25% hydrogen? or please indicate the number of terpene units in the following compound, or perhaps, how many ATP are produced during the glycolysis of ribose? Exam grades are based on the sum of the points gained out of the total number of points available for the exam (100 to 200 pts). Grades are awarded as 100%-90% A, 89%-80% B, 79%-70% C, 69%-60% D, less than 60% F.
Quizzes	Weekly quizzes will be given. Quizzes will be fill in, multiple choice, true/false, and short answer and will be graded on a point scale. A sample question may be, what is the empirical formula of a compound that is 75% carbon and 25% hydrogen? or please indicate the number of terpene units in the following compound, or perhaps, how many ATP are produced during the glycolysis of ribose? Quiz grades are based on the sum of the points gained out of the total number of points available for the quiz (10 to 20 pts). Grades are awarded as 100%-90% A, 89%-80% B, 79%-70% C, 69%-60% D, less than 60% F.
Homework	Students will have assigned reading and homework. Typical assignment may be, Read Chapter 11 and do homework problems 11.1 through 11.20. Reading and homework is evaluated with quizzes, exams, and class discussion.
Lab Activities	Students are required to attend a weekly lab. Students will work individually and in groups. All labs will be checked off by the instructor prior to the student leaving the lab. Labs are graded and returned to the student upon completion. A typical lab will include the collection of experimental data, data analysis, graphical representations of the data, a report on the results and error analysis as well as a section on objectives, procedure, and conclusions. A sample lab might be, The Synthesis of an Ester, or The Identification of an Unknown Compound. Lab grades are based on the sum of the points gained out of the total number of points available for each lab (10 to 20 pts each). Grades are awarded as 100%-90% A, 89%-80% B, 79%-70% C, 69%-60% D, less than 60% F.
Other	Final Exam -- A comprehensive final exam will be given. This exam will be fill in, multiple choice, true/false, short answer, and multistep chemical processes where work must be shown. The exam will be graded on a point scale. A sample question may be, what is the empirical formula of a compound that is 75% carbon and 25% hydrogen? or please indicate the number of terpene units in the following compound, or perhaps, how many ATP are produced during the glycolysis of ribose? The final exam grade is based on the sum of the points gained out of the total number of points available for the exam (200 pts). Grades are awarded as 100%-90% A, 89%-80% B, 79%-70% C, 69%-60% D, less than 60% F.
Other	Mid Term -- There will be three midterm exams. These exams will be fill in, multiple choice, true/false, and short answer, and will be graded on a point scale. A sample question may be, what is the empirical formula of a compound that is 75% carbon and 25% hydrogen? or please indicate the number of terpene units in the following compound, or perhaps, how many ATP are produced during the glycolysis of ribose? Midterm exam grades are based on the sum of the points gained out of the total number of points available for the exam (100 pts each). Grades are awarded as 100%-90% A, 89%-80% B, 79%-70% C, 69%-60% D, less than 60% F.

Other	Regular attendance in the laboratory is required. All labs will be checked off by the instructor prior to the student leaving the lab. The final grade is based on the sum of the points gained out of the total number of points available for the class (about 700 pts). Grades are awarded as 100%-90% A, 89%-80% B, 79%-70% C, 69%-60% D, less than 60% F.

Assignments

Reading Assignments

Reading Assignments:

Daily reading of text; weekly reading of lab manual (ex: Read Chapter 2,"Organic Nomenclature," Sections 2.1 through 2.5 in your text and read the first lab, "Simple Distillations.")

Texts - approximately 500 pages per semester; supplemental materials taken from current journals - approximately 250 pages per semester; Problem-solving workbooks - approximately 200 pages per semester.

Writing Assignments

Notes taken during discussion and lecture; Notes based on reading; Notes detailing problem analysis and solution.

Class Notebook: Data recording, calculations, graphing, conclusions and depending upon the nature of the experiment, records of the experimental design and protocols of equipment and chemical manipulations.

Outside-of-Class Assignments

Class Exercises - at least one per week; Laboratory Experiments - one experiment per week.

SECTION F - Textbooks and Instructional Materials

Material Type

Textbook

Author

Bettelheim, Brown, Campbell, Farrell and Torres

Title

Introduction to General, Organic and Biochemistry

Edition/Version

11th

Publisher

Brooks Cole

Year

2015

Material Type

Textbook

Author

J. Smith

Title

General, Organic, and Biological Chemistry

Edition/Version

3rd

Publisher

McGraw Hill

Year

2015

Material Type
Textbook

Author
Timberlake

Title
General, Organic, and Biological Chemistry: Structures of Life

Edition/Version
6th

Publisher
Pearson

Year
2020

Rationale
Routine Update

ISBN #
9780134763088

Material Type
Manual

Author
R. LaRue

Title
Introductory General, Organic, and Biochemistry Experiments for Allied Health

Publisher
Kendall Hunt Publishing

Year
03-24-2016

Material Type
Manual

Author
Steven Fawl

Title
Laboratory Experiments for Organic and Biochemistry

Publisher
Fountainhead Press

Year
2019

SECTION G - Diversity, Equity and Inclusivity

How does your course and/or course outline of record reflect strategies for accommodating and engaging diverse student populations, advancing equitable outcomes, and fostering inclusion for all students?

This course supports diverse student populations through the use of multiple representations of concepts, varied applications, and technology. Strategies may also include collaborative learning, transparent assessment practices, low-cost resources, alternative formative assessment, structured opportunities for direct communication with the instructor, and opportunities for students to connect course material to their own experiences, fostering equitable outcomes and an inclusive classroom environment.

Course Codes (Admin Only)

CB00 State ID

CCC000105777

CB10 Cooperative Work Experience Status

N - Is Not Part of a Cooperative Work Experience Education Program

CB11 Course Classification Status

Y - Credit Course

CB13 Special Class Status

N - The Course is Not an Approved Special Class

CB23 Funding Agency Category

Y - Not Applicable (Funding Not Used)

CB24 Program Course Status

Program Applicable

Allow Pass/No Pass

Yes

Only Pass/No Pass

No